EFFECTIVENESS OF FISCAL SPENDING IN THE PRESENCE OF PERSISTANT BUDGET DEFICIT IN NAMIBIA: CROWDING OUT OR CROWDING IN

Gaotlhobogwe R. Motlaleng: Department of Economics, University of Botswana P/Bag 0022, Gaborone, Botswana. Email: motlaleg@mopipi.ub.bw
Pinehas Nangula: Email: pnangula@live.com, P.O. Box 1082 Ondangwa, Namibia
Boitumelo Moffat: Department of Economics, University of Botswana P/Bag 0022, Gaborone, Botswana. Email: Boitumelo.moffat@mopipi.ub.bw

Abstract
This paper probes the effectiveness of fiscal spending in the context of crowding out/in hypothesis for Namibia. The neoclassical school advocates that private investment is dampened by an increase in government spending. On the other hand an increase in government spending stimulates private investment in the Keynesian model. Two models have been estimated to carry out this investigation using time series quarterly data for the period 1990:Q1 - 2005:Q2. The first model used government expenditures. The second model employed government budget deficit together with gross domestic product and lending interest rate. The main findings of the paper verify both the Keynesian and neoclassical views for Namibia. While increases in government spending are found to crowd in private investment, government budget deficits are found to crowd it out. The evidence has important implications for fiscal management. If the Namibian government increases its spending and at the same time is running a budget deficit financed through excessive borrowing from the domestic market this has a potential to crowd out private investment.
Keywords: crowding out/in, government spending, government budget deficits, private investment, lending interest rate, gross domestic product, co-integration

I INTRODUCTION

The aim of this paper is to search the effectiveness of fiscal spending in the context of crowding out/in hypothesis in Namibia which is faced with a persistent budget deficit. Generally, fiscal policy is defined as the means by which a government adjusts its levels of spending in order to monitor and influence a nation's economy. A sound fiscal policy is important to promote price stability and sustain growth in output and employment. Fiscal policy is regarded as an instrument that can be used to lessen short run fluctuations in output and employment in many debates of macroeconomic policy. It can also be used to bring the economy to its potential growth level.

Branson (1989) posits that the effectiveness of fiscal policy depends on whether the fiscal policy change is initiated at a low or high level of output relative to full-employment output. This supports the Neoclassical and Keynesian views on fiscal spending. The Neoclassical school argues that an increase in fiscal spending has the potential to crowd out private investment. The Keynesian model argues that an increase in government spending stimulates domestic economic activity and crowds in private investment. It is indicated by Yasim Kustepli (2005) that private investment is an important channel for the effectiveness of fiscal policy in terms of increasing growth in the economy. This is only possible if expansion in fiscal spending can crowd in private investment in the process. Therefore, the effect of fiscal policy on private investment becomes crucial due to its relevance to sustained economic growth.

In Namibia the private sector has remained the primary basis of growth and job creation. For instance, from 1990 to 2008 gross capital formation by the private sector on average has been 16.6% per annum as a percentage of real GDP. This 16.6% of gross capital formation by private sector per annum includes private investments from abroad. At the same time government internal debt has been increasing. In 1990 the total outstanding internal debt was N$29 Million[1]. At the end of December 2008 internal debt had increased to N$9.5 billion because of financing the budget deficit. This is an increase of 327% in eighteen years which is about 37% of 2008 GDP.

Due to the narrow tax base, the economy of Namibia has been facing poor growth of revenue since independence. This forced the government to rely on continuous borrowing from both internal and external sources to finance the budgetary deficit. A country which is heavily reliant on external borrowing to finance its budget deficit is likely to experience a shortage of foreign exchange. According to John (1973), by the early 1960s a heavy burden of external debt service payments created an irreconcilable strain on Brazil's foreign exchange constraint. This precipitated a downward adjustment of intermediate imports and economic growth rates. At the same time, excessive borrowing from the domestic market to finance budget deficits has the potential to raise the cost of borrowing. When the cost of borrowing is high, private investors are likely to reduce their borrowing. This leads to a reduction in private investment in the economy and eventually this slows down economic growth. A budget deficit can crowd out private investment especially if it is financed through excessive borrowing from the domestic market Majumder (2007).

The investigation on the effectiveness of fiscal spending in Namibia is essential in the decision making process. This is because government spending has been on the increase since independence in 1990. On the other hand, the Namibian government has been running a budget deficit for more than a decade. According to Atukeren (2005) increased government involvement in the economy might distort the economic and political environment of business. This can discourage or crowd out private sector investment. He further argued that government might help lay the ground for the development of the private sector. This is done through the provision of legal infrastructure and by undertaking investment that deepen the physical and human capital infrastructure in the country

The paper proceeds as follows. Section II is an overview of trends in fiscal spending in Namibia. Literature on crowding out and crowding in effects is given in section III. The methodology for analysis is outlined in section IV. The empirical results are given in section V. Lastly, section VI presents the conclusions of the paper

II AN OVERVIEW OF TRENDS OF FISCAL SPENDING IN NAMIBIA

This section firstly, presents an overview of Namibia's fiscal spending. Secondly, it outlines government debt structure, real economic growth and the formation of capital by the private sector between 1990 and 2007. Like in other developing countries, the Namibian government has been facing a challenge of generating enough revenue to cover its expenditure. As a result it has been running budget deficits since independence in 1990.

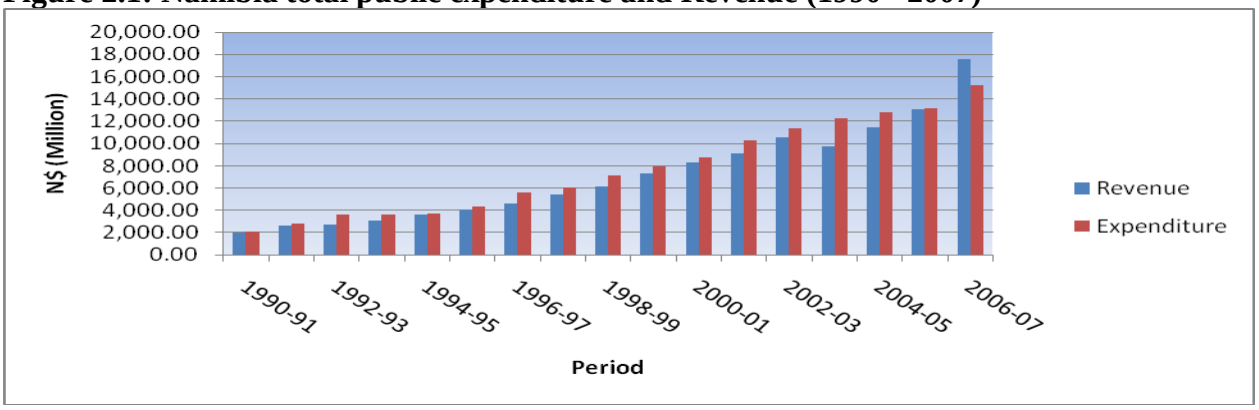
Namibia has recorded a massive growth in total government expenditure relative to growth in total government revenue since independence. Figure 2.1 shows the trend of Namibia total government expenditures and total government revenue over the period 1990 to 2007. As illustrated in Figure 2.1, total government expenditure more than doubled from N$2 103.4

[1] US$1=N$7.60

million[2] in 1990/01 to N$4 556.8 million in 1995/96. It increased further to N$8 650.9 million in 2000/01. Between 2000/01 and 2006/07 total government expenditure increased by N$6 649.1 million which is about 77%. Over this seventeen-year period (between 1990 and 2007), total government expenditure recorded an annual average growth rate of 6.83%. Zaaruka et al (2001) attributed this massive increase in total government expenditure to the increase in the recurrent expenditure[3].

Between 1990 and 2003 Namibia recorded total government revenue increase. In 2004 revenue declined but continued to increase the following year. Since independence the Namibian government has been running a budget deficit each year up to 2007. These budget deficits have been mainly financed through domestic borrowing. This has resulted in increased government domestic debts. Namibia recorded her first budget surplus after independent in 2007 of N$921 Million which is about 2% of GDP. According to PriceWaterHouseCoopers (2007) this surplus came as a result of increased payments from the Southern African Customs Union (SACU).

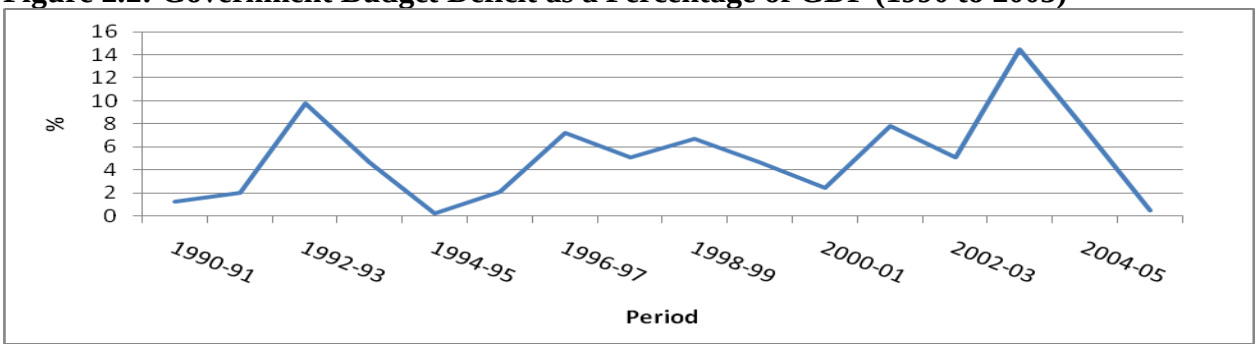
Figure 2.1: Namibia total public expenditure and Revenue (1990 - 2007)



Source: Own constructions, data source: Bank of Namibia annual reports; various issues

Figure 2.2 portrays government budget deficits as a percentage of gross domestic products during 1990 to 2005. During 1990 to 2005, government budget deficits have been relatively low and fluctuating between 0.1% and 10% of GDP. On average, Government budget deficits have been 5.1% of GDP each year.

Figure 2.2: Government Budget Deficit as a Percentage of GDP (1990 to 2005)



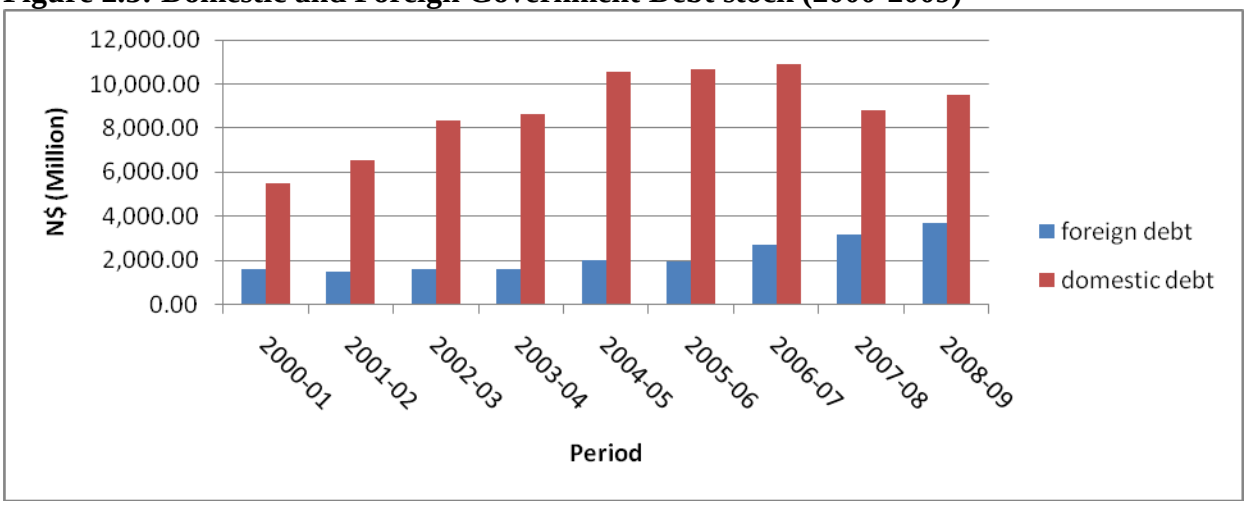
Source: Own constructions, data source: Bank of Namibia annual reports; various issues

[2] US$1=N$7.60

[3] Recurrent includes remuneration, employer's contribution to GIPF, external and internal relations, property and rental charges and subsidies and other current transfers.

Figure 2.3 portrays government debt structure between 2000 and 2009. Between 2000 and 2009 government domestic debt has been high compared to government foreign debt which has been relatively low. According to the Bank of Namibia (2009) government internal debt increased to N$9.5 billion at the end of December 2008 from the N$8.8 billion recorded at the end of 2007/08.

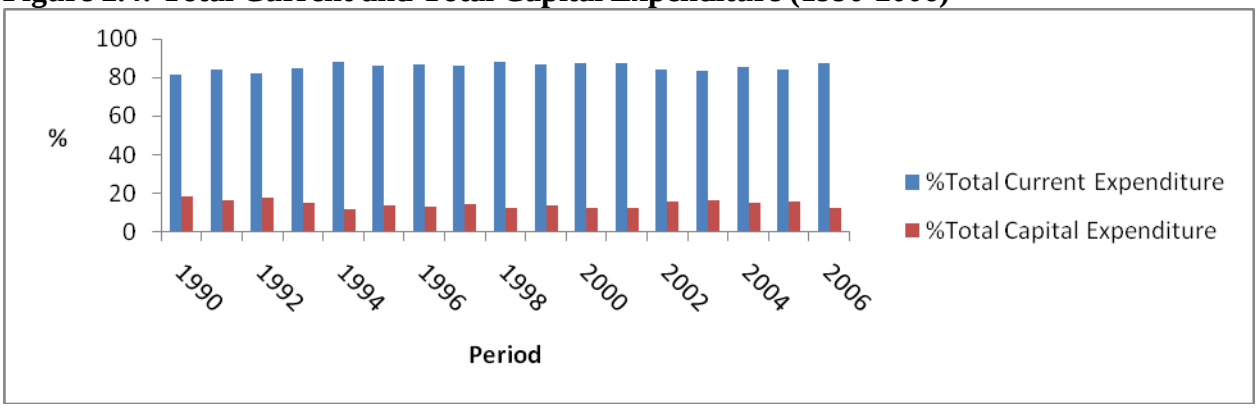
Figure 2.3: Domestic and Foreign Government Debt stock (2000-2009)



Source: Own constructions, data source: Bank of Namibia annual reports; various issues

Figure 2.4 shows current and capital expenditure between 1990 and 2006. Since independence, total capital expenditure has been less than 20% of the total government expenditure each year. This implies that total current expenditure has been more than 80% of total government expenditure each year. It is quite interesting to note that although Namibia's fiscal spending since independence has been increasing by 6.83% per year the country has experienced slow economic growth.

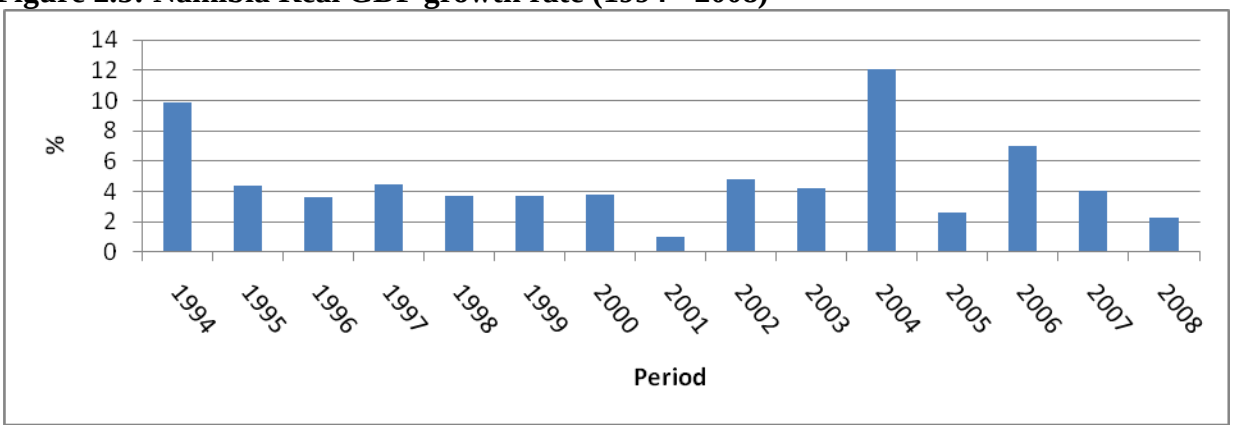
Figure 2.4: Total Current and Total Capital Expenditure (1990-2006)



Source: Own constructions, data source: Bank of Namibia annual reports of various issues

Figure 2.5 portrays a trend of Namibia real gross domestic product (GDP) growth rate for the period from 1994 to 2008. Economic growth since independence has averaged 4.5% per annum. Currently, from figure 2.5, real GDP grew by 7.2% in 2006 and 4.1% in 2007. The highest real GDP growth rate Namibia has ever recorded since independence was of more than 12% in 2004.

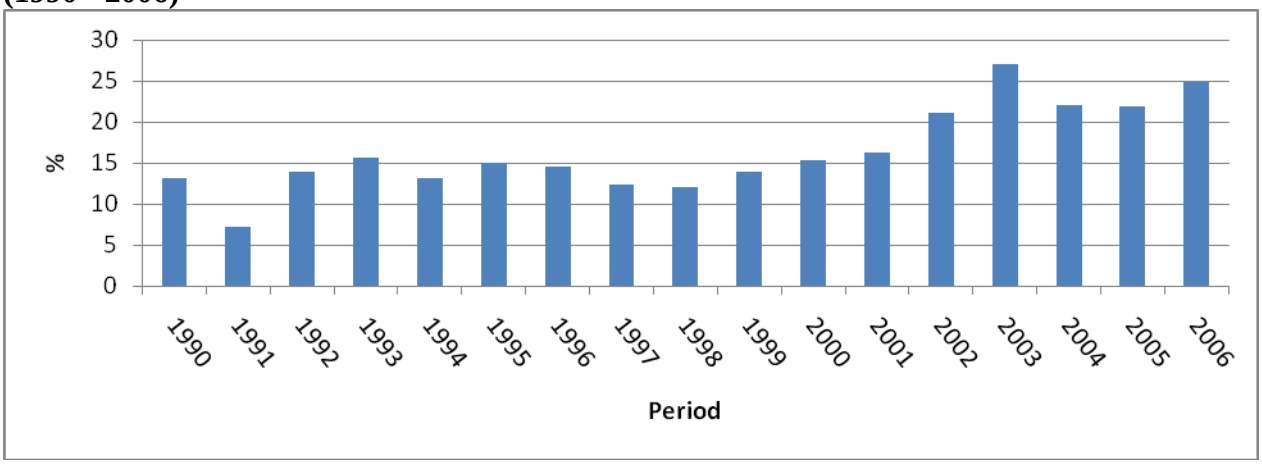
Figure 2.5: Namibia Real GDP growth rate (1994 - 2008)



Source: World Bank (2009)

Figure 2.6 illustrates the trend of gross fixed capital formation by the private sector as a percentage of real GDP. This covers the period from 1990 to 2006. On average, gross capital formation by the private sector in Namibia has been around 16.6% of real GDP. According to the Regional Indicative Strategic Development Plan (2008), each SADC member state is supposed to have experienced an increase in domestic investment levels of at least 30% of GDP by 2008. It is clear that Namibia has not been able to meet that additional secondary target.

Figure 2.6: Gross Fixed Capital Formation by Private sector as % of Real GDP in Namibia (1990 - 2006)



Source: Own construct, data source: Bank of Namibia annual reports; various

III REVIEW OF PREVIOUS STUDIES

There are different views on the relationship between fiscal spending and private investment. These include the Neoclassical and the Keynesian views. The Neoclassical view assumes full employment and advocates for competitive markets and against government intervention. The neoclassical loanable funds theory explains that the balancing of savings and investment will be solved by the interest rate mechanism. The malfunctioning or slow operations

of this mechanism are attributed to the short-term variations in employment and output (Ganelli, 2003). The neoclassical school advocates that private investment is dampened by an increase in fiscal spending. This is because interest rates are likely to increase in order to bring the capital market into equilibrium. A closed-economy IS-LM model suggests that increased government spending will push up real interest rates and discourage private investment. As government spending increases, it raises planned aggregate expenditure, which boosts aggregate output. In the process it increases real demand for money and reduces the demand for bonds. This depresses bond prices and raises the interest rate. At the same time, open economy IS-LM model suggest that an increase in government spending will increase domestic interest above world interest rate and domestic outputs will increase. As results there will be inflow of money into the country causing the currency to appreciate. The appreciation reduces net exports and shifts the IS curve back. The process will continue until domestic interest rate has returned to the world interest rate. Therefore, in the short run expansionary fiscal policy has no effect on a domestic interest rate.

On the other hand, an increase in government spending stimulates private investment in the Keynesian model. The Keynesian view, assumes that there is unemployment in the economy and that the interest rate sensitivity of investment is low. In that case, expansionary fiscal policy will lead to little or no increases in the interest rate and increase output and employment. Additionally, this view assumes that government spending increases private investment. This is due to the positive effect of government spending on the expectations of the investors. Therefore, there is crowding in rather than crowding out.

There is a large body of literature on the crowding-in or out effect of public spending or borrowing on private investment for different economies. For instance, recent empirical studies by Hyder (2002), Arukeren (2005), Yasim Kustepli (2005), Majumder (2007) and, Khan and Gill (2009) found evidence that supports the crowding-in effect of public spending or borrowing on private investment. On the contrary, studies that discovered crowding-out effect of public spending are those by Ahmed and Miller (1999), Cavallo and Daude (2008), Adnan et al (2009), António and Ricardo (2009) and Sarah Beth (2009).

In the case of Namibia, little has been done to investigate the crowding out and crowding in effect. Ashipala, and Haimbodi, (2003) tested the Impact of Public Investment on economic growth in Namibia, the Republic of South Africa and Botswana in which Namibia was their main focus. Their main objective was to investigate whether in the case of Namibia, RSA and Botswana, public investment leads to an increase in private investment and in turn in GDP. Their empirical analysis indicated that private investment has a significant positive effect on GDP in both the South African and Namibian cases. In the case of Botswana, it has an insignificant positive effect on GDP. They also found that although public investment had the expected positive sign, the effect of public investment on GDP was found to be statistically insignificant in all three cases. Thefore, no strong inferences were drawn from those findings. They only concluded that given the available data, public investment and GDP were found to be positively correlated. They also concluded that there was no evidence of a strong crowding-out effect in the three cases rather public investment and private investment complement each other.

III METHOD OF ANALYSIS

This section presents the methodology used for analyzing the effectiveness of fiscal spending in Namibia. We have employed the same investment model used by Yasim Kustepli (2005) in testing the effectiveness of fiscal spending in Turkey. Kustepli used two fiscal variables: government spending and government budget deficits. He estimated two investment models. One

model used government spending and using data for the period 1967-2003.The other model employed the government budget deficit and using data for the period 1963-2003 in addition to interest rates and income. This paper used Vector Error Correction Model (VECM) to estimate the results. We applied the VECM to find out the speed of adjustment the variables follow towards the long-run equilibrium path in responses to any divergence that occurred on the short run. In order to test the effectiveness of fiscal spending in the crowding out context in Namibia, two fiscal variables have been used. These are government expenditures and the budget deficits. Two investment models have been estimated. The first investment model used government expenditures. The second investment model used government budget deficit together with log of gross domestic product and lending interest rate.

Model Specification

The two investment functions are defined as follows:

Model 1

$$GFCF_t = \lambda_1 + LENDINGRATE_t^{\beta_1} + GDP_t^{\beta_2} + GE_t^{\beta_3} + \varepsilon_t \quad (3.1a)$$

Model 2

$$GFCF_t = \eta_1 + LENDINGRATE_t^{\alpha_1} + GDP_t^{\alpha_2} + GDEF_t^{\alpha_3} + \varepsilon_t \quad (3.1b)$$

Where;Gross Fixed Capital Formation by private sector (GFCF), Lending Interest Rate (LENDRATE), Real Gross Domestic Product (GDP), Government Expenditure (GE), and Government Budget Deficit (GDEF).

Taking the logs of investment functions so that the coefficients represent elasticity and adding an error terms yield the following.

Model 1

$$LGFCF_t = \lambda_1 + \beta_1 \ln LENDRATE_t + \beta_2 \ln LGDP_t + \beta_3 \ln LGE_t + \varepsilon_t \quad (3.2a)$$

Model 2

$$LGFCF_t = \eta_1 + \alpha_1 \ln LENDRATE_t + \alpha_2 \ln LGDP_t + \alpha_3 \ln LGDEF_t + \varepsilon_t \quad (3.2b)$$

In this study we have analyzed the relationship between private investment and government expenditures and government budget deficits by means of a Vector Autoregressive (VAR) model structure. A VAR describes the dynamic evolution of a number of variables (k), from their common history. If we consider a system with three variables, Y_t, X_t and Z_t then the VAR consists of three equations. A VAR (1) is specified as follows:

$$Y_t = \alpha_1 + \beta_{11}Y_{t-1} + \beta_{12}X_{t-1} + \beta_{13}Z_{t-1} + \varepsilon_{1t} \quad (3.3a)$$

$$X_t = \alpha_2 + \beta_{21}Y_{t-1} + \beta_{22}X_{t-1} + \beta_{23}Z_{t-1} + \varepsilon_{2t} \quad (3.3b)$$

$$Z_t = \alpha_3 + \beta_{31}Y_{t-1} + \beta_{32}X_{t-1} + \beta_{33}Z_{t-1} + \varepsilon_{3t} \quad (3.3c$$

Where ε_{1t}, ε_{2t} and ε_{3t} are white noise processes (which are independent of the history of Y, X and Z). In the matrix format the system can be expressed as follows.

$$\begin{bmatrix} Y_t \\ X_t \\ Z_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} \\ \beta_{21} & \beta_{22} & \beta_{23} \\ \beta_{31} & \beta_{32} & \beta_{33} \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ X_{t-1} \\ Z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix}$$

The general VAR (ρ) model is specified as follows.

$$X_t = \beta_1 X_{t-1} + \beta_2 X_{t-2} + \cdots + \beta_\rho X_{t-\rho} + \varepsilon_t$$

$$X_t = \sum_{t=1}^{\rho} \beta_t X_{t-1} + \varepsilon_t \quad (3.4$$

t = 1, 2, 3……. ρ

Our investment function model (3a) in VAR presentation, matrix format becomes:

$$\begin{bmatrix} LGFCF_t \\ LENDRATE_t \\ LGDP_t \\ LGE_t \end{bmatrix} = \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \\ \lambda_4 \end{bmatrix} + \begin{bmatrix} \beta_{11}^1 & \beta_{12}^1 & \beta_{13}^1 & \beta_{14}^1 \\ \beta_{21}^1 & \beta_{22}^1 & \beta_{23}^1 & \beta_{24}^1 \\ \beta_{31}^1 & \beta_{32}^1 & \beta_{33}^1 & \beta_{34}^1 \\ \beta_{41}^1 & \beta_{42}^1 & \beta_{43}^1 & \beta_{44}^1 \end{bmatrix} \begin{bmatrix} LGFCF_{t-1} \\ LENDRATE_{t-1} \\ LGDP_{t-1} \\ LGE_{t-1} \end{bmatrix} + \begin{bmatrix} \beta_{11}^2 & \beta_{12}^2 & \beta_{13}^2 & \beta_{14}^2 \\ \beta_{21}^2 & \beta_{22}^2 & \beta_{23}^2 & \beta_{24}^2 \\ \beta_{31}^2 & \beta_{32}^2 & \beta_{33}^2 & \beta_{34}^2 \\ \beta_{41}^2 & \beta_{42}^2 & \beta_{43}^2 & \beta_{44}^2 \end{bmatrix}$$

$$\begin{bmatrix} LGFCF_{t-2} \\ LENDRATE_{t-2} \\ LGDP_{t-2} \\ LGE_{t-2} \end{bmatrix} + \ldots + \begin{bmatrix} \beta_{11}^\rho & \beta_{12}^\rho & \beta_{13}^\rho & \beta_{14}^\rho \\ \beta_{21}^\rho & \beta_{22}^\rho & \beta_{23}^\rho & \beta_{24}^\rho \\ \beta_{31}^\rho & \beta_{32}^\rho & \beta_{33}^\rho & \beta_{34}^\rho \\ \beta_{41}^\rho & \beta_{42}^\rho & \beta_{43}^\rho & \beta_{44}^\rho \end{bmatrix} \begin{bmatrix} LGFCF_{t-\rho} \\ LENDRATE_{t-\rho} \\ LGDP_{t-\rho} \\ LGE_{t-\rho} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{ (3.5.}$$

Where

β_i – is a(4x4) matrix of parameters, all of which are non-zero, ε_i – column vector (4x1) of random disturbance values, which may be contemporaneously correlated with one another but are assumed to be non-auto correlated over-time. ρ- is the lag length of the VAR.

Vector Error Correction Model (VECM)

Based on equation (3.3a), the error correction model is obtained by subtracting X_{t-1} from both sides of the equation (3.3a) and then rearranging terms:

$$\Delta X_t = \prod X_{t-1} + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \cdots + \Gamma_{k-1} \Delta X_{t-(\rho-1)} + \varepsilon_t$$

$$\Delta X_t = \prod X_{t-1} + \sum_{j=1}^{\rho-1} \Gamma_j X_{t-j} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.6)}$$

In matrix format as in (3.6), the investment function becomes:

$$\begin{bmatrix} \Delta LGFCF_t \\ \Delta LENDRATE_t \\ \Delta LGDP_t \\ \Delta LGE_t \end{bmatrix} = \prod \begin{bmatrix} LGFCF_{t-1} \\ LENDRATE_{t-1} \\ LGDP_{t-1} \\ LGE_{t-1} \end{bmatrix} + \Gamma_1 \begin{bmatrix} \Delta LGFCF_{t-1} \\ \Delta LENDRATE_{t-1} \\ \Delta LGDP_{t-1} \\ \Delta LGE_{t-1} \end{bmatrix} + \Gamma_2 \begin{bmatrix} \Delta LGFCF_{t-2} \\ \Delta LENDRATE_{t-2} \\ \Delta LGDP_{t-2} \\ \Delta LGE_{t-2} \end{bmatrix}$$

$$+ \ldots + \Gamma_{\rho-1} \begin{bmatrix} \Delta LGFCF_{t-(\rho-1)} \\ \Delta LENDRATE_{t-(\rho-1)} \\ \Delta LGDP_{t-(\rho-1)} \\ \Delta LGE_{t-(\rho-!)} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{3.7)}$$

Where; Δ - is the first difference operator

$\prod = -(\mathrm{I} - \beta_1 - \ldots. - \beta_\rho)$ and $\Gamma_j = (\beta_{i+1} + \ldots + \beta_\rho)$, for i=1,…, $\rho - 1$

∏ and Γ are (n x n) coefficient matrices. ∏ gives information about the long-run relationships between X_t variables. The number of linearly independent combinations of the variables indicates the rank of∏. This rank can be obtained using the trace (Tr) or the maximum eigen - value (λ_{mm}) statistics.

This paper employed quarterly (1990-1 to 2005-2) time series data of the variables; gross domestic product, lending interest rate, total government expenditures, government budgets deficits and gross fixed capital formation by the private sector which is a proxy for private investment. The data has been sourced mainly from the central bank of Namibia and the Central Bureau of Statistics of Namibia. We were only able to collect quarterly data for lending interest rates but gross domestic product, total government expenditures, government deficits and gross

fixed capital formation by private sector were only available on annually basis. Therefore Al-Turki (1995) method was used to transform these available annual data into quarterly data.

V EMPIRICAL RESULTS

This section presents the empirical findings. In this study we employ the same investment models which were used by Yasim Kustepli (2005). In order to test the effectiveness of fiscal spending in the crowding out context, two fiscal variables have been used. These are total government expenditures and budget deficit. The first model used total government expenditures. The second model used government budget deficit in the equation among log of gross domestic product and lending interest rate. The first results are for the model which includes total government expenditures as independent variable. The second results are for the model which include government budget deficit as one of the independent variables.

5.1 The Results for Unit Roots in the Data, 1990; 1 – 2005; 2

As a prerequisite for the co-integration test, stationary properties of the relevant variables have been verified by performing Augmented Dickey-Fuller (ADF) tests. The null hypothesis is that the variable under investigation has a unit root, against the alternative hypothesis that it does not have a unit root. The results of the Augmented Dickey-Fuller (ADF) test for all the variables are shown in Table 5.1.

Table 5.1 Results of Unit Root Test for Stationarity

Test	Trend assumption	Level/ differenced	LGDP	LGE	LENDING RATE	LGFCF	LGDEF
ADF	Constant	Level	-2.67 (-3.54)	-1.04 (-3.54)	-0.37 (-3.54)	-2.60 (-3.55)	-3.36 (-3.54)
		First difference	-9.76* (-3.54)	-4.02* (-3.54)	-6.39* (-3.54)	-3.31** (-2.92)	-4.36* (-3.55)
	Constant and trend	Level	-2.59 (-4.12)	-1.66 (-4.12)	-1.60 (-4.12)	-3.40 (-4.13)	-4.08 (-4.12)
		First difference	-10.12* (-4.12)	-3.82** (-3.49)	-6.39* (-4.12)	-3.42*** (-3.18)	-4.30* (-4.12)

Note: 1. The numbers in the parenthesis are the are the critical values at different level of significances

2. * indicates stationarity at1%, ** indicate stationarity at 5% and *** indicate stationarity at 10%

3. LGDP=log of gross domestic product, LGE=log of government expenditure, LGFCF=log of gross fixed capital formation by private sector, LGDEF=log of government deficit

The results of the test presented in Table 5.1 suggest that at 1 percent level of significance; gross domestic product (LGDP), total government expenditure (LGE), Lending rate, gross fixed capital formation (LGCF) and government deficit (LGDEF) have been found to be non-stationary in level form. i.e., we don't reject the null hypothesis. All the variables become stationary at first difference i.e., they are integrated of order one I(1). This means that all the variables can be included in the Johansen Co-integration tests.

5.2 Johansen Co-integration Test Results

The above set of stationarity properties allow us to exercise the Johansen co-integration test for estimating long run relationship between the dependent variable LGFCF and the independent variable. These are LGDP, LGE and Lending Rate in the first model and in the second model including LGDEF as one of the independent variable replacing LGE.

In this regards, the first step is to choose a specific lag length for each model. This lag length should be high enough to ensure that the errors are approximately white noise, but small enough to allow estimation. Akaike information Criterion (AIC) is used to select the order of the VAR models. For both models the Akaike information Criterion chooses ten lags (k=10). The lag length suggested by AIC which is ten is the highest lag length that allows estimation and give us the correct sign for the model.

Table 5.2 displays the results of Johansen co-integration tests for the first model which includes total government expenditures and excludes government deficits. Both the Trace and Max-eigen statistics reported in Table 5.2 for the first model indicates that there are at least four co-integrating vectors between LGFCF, LGE, LGDP and LENDING_RATE at 5 percent level of significance.

Table 5.2 Johansen Co-integration Analysis for Model (1)

Unrestricted Cointegration Rank Test (Trace)			
Variables: LGFCF, LGE, LGDP, LENDING_RATE			
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**
r = 0*	275.1953	54.07904	0.0001
r ≥ 1 *	179.7845	35.19275	0.0001
r ≥ 2*	99.31247	20.26184	0.0000
r ≥ 3*	29.34056	9.164546	0.0005
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)			
Variables: LGFCF, LGE, LGDP, LENDING_RATE			
Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.**
r = 0 *	95.41079	28.58808	0.0000
r ≥ 1*	80.47202	22.29962	0.0000
r ≥ 2 *	69.97191	15.89210	0.0000
r ≥ 3*	29.34056	9.164546	0.0000

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Thus it can be claimed that there is a long run equilibrium relationship between gross fixed capital formations, total government expenditures, gross domestic product and lending interest rate.

Table 5.3 presents all the possible co-integrating vectors with normalized co-integrating coefficients of gross fixed capital formation, total government expenditures, gross domestic product and the lending interest rate.

Table 5.3 Normalized Co-integrating Coefficients (t-statistic in parentheses)

LGCF(-1)	1.000000	-0.766419	-0.997730	41.05622
		(-8.62660)	(-8.34943)	(8.64447)
LGDP(-1)	-1.304770	1.000000	1.301808	-53.56892
	(-4.03241)		(3.29109)	(-7.92673)
LGE(-1)	-1.002275	0.768162	1.000000	-41.14963
	(-6.55037)	(5.52363)		(-5.46539)
LENDING_RATE(-)	0.024357	-0.018668	-0.024302	1.000000
	(4.20107)	(-8.24120)	(-3.38558)	
C	11.31884	-8.674971	-11.29315	464.7089

The long run co-integrating relationships between gross capital formation, total government expenditures, gross domestic product and lending rate are given below.

$$LGFCF = -11.31884 + 1.304770LGDP - 0.024357LENDING\_RATE + 1.002275LGE \quad [5.1]$$

t-value (4.03241) (-4.20107) (+6.55037)

$$LGDP = 8.674971 + 0.766419\ LGFCF - 0.768162LGE + 0.018668LENDING\ RATE \quad [5.2]$$

t-value (8.62660) (-5.52363) (8.24120)

$$LGE = 11.29315 + 0.997730GFCF - 1.301808GDP + 0.024302LENDING\ RATE \quad [5.3]$$

t-value (8.34943) (-3.29109) (3.38558)

$$LENDING\ RATE = -464.7089 - 41.05622LGFCF + 53.56892LGDP + 41.14963LGE \quad [5.4]$$

t-value (-8.64447) (7.92673) (5.46539)

According to the equation [5.1] above, in the long-run, gross domestic product, lending interest rate and total government expenditure seems to have statistically significant impact on private investment and all the variables are found to have expected signs. A 1% increase in GDP will result in a 1.31 % increase in private investment and a 1% increase in lending interest rate will result in a 0.02% decrease in private investment. Total government expenditure coefficient is positive and statistically significant and this suggests that total government expenditure crowding in private investment in Namibia consistent with the Keynesian model.

Equation 5.2 and 5.3 are not consistent with conventional macro economy theory. Equation 5.2 and 5.3 suggest that a one per cent increase in lending interest rate will result in 0.018668% and 0.024302% increases in gross domestic product and government expenditure respectively. A 1% increase in government expenditure will results in 0.768162% decrease in gross domestic product. A 1% increase in gross fixed capital formation will result in 0.766419% and 0.997730 per-cent increases in gross domestic product and government expenditure respectively. This suggests that for Namibia's economy to grow, private investment must be encouraged.

The last equation (5.4) is consistent with conventional macro economy theory. All the variables have the correct sign and are statistically significant. Unexpectedly high quarterly GDP growth is

perceived to be potentially inflationary if the economy is close to full capacity. This, in turn, causes bond prices to drop and yields and interest rates to rise. Government spending increases interest rates which decrease private investment.

Table 5.4 displays the results of Johansen co-integration test for the second model which includes government deficits and excludes government spending. Both the Trace and Max-eigen statistics reported in Table 5.4 for the second model indicate that there are at least four co-integrating vectors between LGFCF, LGDEF, LGDP and LENDING_RATE at the 5 percent level of significance. Thus it can be claimed that there is a long run equilibrium relationship between gross fixed capital formations, government deficits, gross domestic product and lending interest rate.

Table 5.4 Johansen Co-integration Analysis for Model (2)

Unrestricted Cointegration Rank Test (Trace)			
Variables: LGFCF, LGDEF, LGDP, LENDING_RATE			
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**
r = 0 *	506.4149	63.87610	0.0001
r ≥ 1*	237.7005	42.91525	0.0000
r ≥ 2 *	133.6572	25.87211	0.0000
r ≥ 3*	43.48404	12.51798	0.0000
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)			
Variables: LGCF, LDEF, LGDP, LENDING_RATE			
Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.**
r = 0 *	268.7145	32.11832	0.0000
r ≥ 1*	104.0433	25.82321	0.0000
r ≥ 2 *	90.17315	19.38704	0.0000
r ≥ 3*	43.48404	12.51798	0.0000

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table 5.5 presents all the possible co-integrating vectors with normalized co-integrating coefficients of gross fixed capital formation, total government budget deficit, gross domestic product and lending interest rate.

5.5 Normalized Co-integrating Coefficients (t-statistic in parentheses)

LGFCF(-1)	1.000000	-0.115983	1.094608	11.87215
		(-4.35263)	(1.54564)	(1.72584)
LGDP(-1)	-8.621947	1.000000	-9.437650	-102.3611
	(-8.72572)		(-2.87257)	(-3.10758)
LGDEF(-1)	0.913569	-0.105959	1.000000	10.84603
	(7.09243)	(-6.57521)		(6.66384)
LENDING_RATE(-)	0.084231	-0.009769	0.092200	1.000000
	(4.22210)	(-3.79227)	(3.55274)	
C	57.99077	-6.725948	63.47714	688.4752

The long run co-integrating relationships between gross fixed capital formations, the total government budget deficits, gross domestic product and the lending rate are given below.

$$LGFCF = -57.99077 + 8.621947LGDP - 0.084231LENDING\_RATE - 0.913569LGDEF \quad [5.5]$$

t-value **[8.72572]** **[-4.22210]** **[-7.09243]**

$$LGDP = 6.725948 + 0.115983LGFCF + 0.105959LGDEF + 0.009769LENDING\ RATE \quad [5.6]$$

t-value **[4.35263]** **[6.57521]** **[3.79227]**

$$LGDEF = -63.47714 - 1.094608GFCF + 9.437650LGDP - 0.092200LENDING\ RATE \quad [5.7]$$

t-value **[-1.54564]** **[2.87257]** **[3.55274]**

$$LENDING\ RATE = -688.4752 - 11.87215LGFCF + 102.361LGDP - 10.8460LGDEF \quad [5.8]$$

t-value **[-1.72584]** **[3.10758]** **[-6.66384]**

According to the equation (5.5) above, in the long-run, gross domestic product, lending interest rate and government deficits seems to have statistically significant impact on private investment and all the variables are found to have expected signs. A 1% increase in GDP will result in an 8.62% increase in private investment and a one percent increase in lending interest rate will result in an 0.08% decrease in private investment. Government deficits coefficient (-0.913569) is negative and statistically significant and this seems to suggest that government deficits crowding out private investment in Namibia consistent with the neoclassical argument.

Equation 5.6, 5.7 and 5.8 are not consistent with conventional macro economy theory.

5.3 Vector Error Correction Model (VECM) Results

Table 5.6 shows results of the vector error correction model (VECM) of Namibia's private investment. The results show that only the error correction term for gross fixed capital formation has the correct sign and statistical significance. About 87% of the adjustment of Namibia's private investment toward long-run equilibrium takes place per quarter. This is relatively a fast rate of adjustment.

Table 5.6 Error Correction Model (ECM) Results for Private Investment

	Equation1	Equation 2	Equation 3	Equation 4
	Δ(LGCF)	Δ(LENDING_RATE)	Δ(LGE)	Δ(LGDP)
Δ(LGCF(-1))	0.876095 [3.02752]	1.570509 [0.25061]	0.052742 [0.55791]	0.356401 [1.34671]
Δ(LGCF(-2))	0.444946 [1.25168]	4.427618 [0.57514]	-0.110101 [-0.94809]	-0.230822 [-0.71000]
Δ(LGCF(-3))	0.493066 [1.09628]	-3.186949 [-0.32720]	0.058719 [0.39964]	-0.937106 [-2.27826]
Δ(LGCF(-4))	-0.242537 [-0.43368]	8.147901 [0.67276]	-0.084418 [-0.46207]	-0.425536 [-0.83202]
Δ(LGCF(-5))	0.657068 [1.42843]	6.096275 [0.61197]	0.149502 [0.99487]	0.334470 [0.79507]
Δ(LGCF(-6))	-0.081277 [-0.15323]	-9.539352 [-0.83043]	-0.111261 [-0.64207]	0.347545 [0.71644]
Δ(LGCF(-7))	0.132845 [0.32597]	-2.438481 [-0.27629]	0.042296 [0.31769]	-0.637071 [-1.70930]

Δ(LGCF(-8))	0.328396 [0.70006]	6.515974 [0.64141]	-0.063176 [-0.41225]	-0.288338 [-0.67211]
Δ(LGCF(-9))	0.326954 [0.90400]	3.890145 [0.49667]	0.069118 [0.58499]	-0.275132 [-0.83181]
Δ(LGCF(-10))	0.040199 [0.12350]	-0.811539 [-0.11512]	0.014277 [0.13426]	0.080309 [0.26977]
Δ(LENDING_RATE(-1))	0.041271 [2.02759]	0.426962 [0.96859]	-0.005013 [-0.75384]	-0.026179 [-1.40634]
Δ(LENDING_RATE(-2))	0.052857 [2.04184]	0.345568 [0.61641]	-0.002005 [-0.23704]	-0.050574 [-2.13622]
Δ(LENDING_RATE(-3))	0.048309 [1.55560]	-0.175694 [-0.26124]	-0.001326 [-0.13066]	-0.044002 [-1.54929]
Δ(LENDING_RATE(-4))	0.060997 [1.91679]	0.589982 [0.85610]	-0.000674 [-0.06483]	-0.036698 [-1.26099]
Δ(LENDING_RATE(-5))	0.046798 [1.62389]	0.206337 [0.33062]	-0.002798 [-0.29718]	-0.026220 [-0.99487]
Δ(LENDING_RATE(-6))	0.026043 [1.03413]	0.323428 [0.59303]	-0.004999 [-0.60767]	-0.035011 [-1.52014]
Δ(LENDING_RATE(-7))	**0.050117*** **[2.02437**]	0.181730 [0.33896]	0.003541 [0.43787]	-0.031976 [-1.41232]
Δ(LENDING_RATE(-8))	0.040769 [1.94256]	0.023655 [0.05205]	-0.007960 [-1.16100]	-0.013743 [-0.71604]
Δ(LENDING_RATE(-9))	0.034955 [1.35377]	0.461125 [0.82465]	0.001321 [0.15661]	-0.040195 [-1.70219]
Δ(LENDING_RATE(-10))	0.029606 [1.38566]	0.366512 [0.79210]	0.003949 [0.56578]	-0.021782 [-1.11472]
Δ(LGE(-1))	1.146604 [1.24686]	7.565336 [0.37988]	0.702671 [2.33898]	-2.274552 [-2.70456]
Δ(LGE(-2))	1.185741 [1.02423]	-24.86986 [-0.99197]	0.111896 [0.29586]	-0.012995 [-0.01227]
Δ(LGE(-3))	0.180150 [0.17026]	15.17239 [0.66214]	-0.017378 [-0.05027]	-0.476226 [-0.49214]
Δ(LGE(-4))	-1.594360 [-1.57594]	22.20389 [1.01344]	-0.241678 [-0.73124]	1.036086 [1.11982]
Δ(LGE(-5))	-0.686794 [-0.45305]	-14.19784 [-0.43248]	0.433831 [0.87602]	2.074728 [1.49652]
Δ(LGE(-6))	-0.892189 [-0.49752]	-10.40859 [-0.26802]	-0.151792 [-0.25911]	0.779332 [0.47520]
Δ(LGE(-7))	-0.467544 [-0.32639]	-18.42235 [-0.59385]	0.171737 [0.36698]	-0.300765 [-0.22958]
Δ(LGE(-8))	0.609116 [0.45019]	32.03599 [1.09332]	-0.597118 [-1.35090]	0.069671 [0.05630]
Δ(LGE(-9))	0.235612 [0.16680]	5.858069 [0.19150]	0.584106 [1.26576]	-2.274026 [-1.76028]
Δ(LGE(-10))	0.238237 [0.19683]	-27.09095 [-1.03354]	-0.262923 [-0.66494]	2.004615 [1.81098]

Δ(LGDP(-1))	-0.554090 [-1.44013]	-8.493368 [-1.01934]	0.127303 [1.01282]	-0.300382 [-0.85368]
Δ(LGDP(-2))	-0.357837 [-0.88939]	1.493687 [0.17143]	0.044622 [0.33949]	0.069635 [0.18925]
Δ(LGDP(-3))	-0.240491 [-0.60219]	-4.486014 [-0.51870]	0.075656 [0.57990]	-0.027617 [-0.07561]
Δ(LGDP(-4))	-0.330627 [-0.80248]	-1.650779 [-0.18501]	0.043883 [0.32603]	0.422207 [1.12051]
Δ(LGDP(-5))	-0.331050 [-0.89175]	6.058287 [0.75356]	0.031907 [0.26309]	0.537441 [1.58299]
Δ(LGDP(-6))	-0.434289 [-0.88443]	-7.820543 [-0.73542]	0.015256 [0.09510]	0.230997 [0.51439]
Δ(LGDP(-7))	-0.155400 [-0.42251]	0.375541 [0.04715]	-0.019397 [-0.16143]	0.093127 [0.27686]
Δ(LGDP(-8))	0.226261 [0.75093]	6.473354 [0.99206]	-0.022748 [-0.23110]	0.128049 [0.46469]
Δ(LGDP(-9))	0.022723 [0.07627]	2.644119 [0.40985]	-0.044324 [-0.45545]	-0.030290 [-0.11118]
Δ(LGDP(-10))	0.315679 [1.18109]	4.574216 [0.79026]	0.041652 [0.47702]	0.025456 [0.10414]
ECT	-0.869191 [-2.15012]	-4.339601 [-0.49569]	0.029222 [0.22127]	0.624632 [1.68955]
R-squared	0.949528	0.738684	0.846629	0.862697
Adj. R-squared	0.747639	-0.306579	0.233147	0.313485
Sum sq. resids	0.023716	11.12261	0.002531	0.019836
S.E. equation	0.048699	1.054638	0.015909	0.044537
F-statistic	4.703220	0.706697	1.380038	1.570792
Log likelihood	123.3067	-33.53329	180.3634	127.8628
Akaike AIC	-3.227712	2.922874	-5.465231	-3.406386
Schwarz SC	-1.674676	4.475910	-3.912194	-1.853350

According to the dynamics of the gross fixed capital formation equation (equation 1), only the lending rate has short run effects on Namibia's gross fixed capital formation in addition to the long run effects.

Table 5.7 shows results of the vector error correction model (VECM) of Namibia's private investment. The results show that only the error correction term of the lending interest rate has the correct (negative) sign and statistically significance but it is more than one so therefore we cannot use this result to explain the impact that the lending interest rate has on gross fixed capital formation in the short run. The error correction term of the government budget deficit has the correct (negative) sign but it is statistically insignificance and the rest of the error correction terms have the wrong (positive) signs and statistically insignificant. These set of results cannot be used to explain the impact of the government budget deficit, lending interest rate and gross domestic product on the gross fixed capital formation in the short run.

Table 5.7 Error Correction Model (ECM) Results for Private Investment

	Equation1	Equation 2	Equation 3	Equation 4
	Δ(LGCF)	Δ(LENDING_RATE)	Δ(LGDEF)	Δ(LGDP)
Δ(LGCF(-1))	0.178816 [0.59554]	8.647027 [2.62975]	0.223492 [0.13932]	0.445506 [1.67609]
Δ(LGCF(-2))	**0.789788** **[2.16291]**	7.777794 [1.94504]	5.549489 [2.84464]	0.276251 [0.85462]
Δ(LGCF(-3))	-0.012151 [-0.03184]	-4.964007 [-1.18767]	0.579040 [0.28397]	0.090072 [0.26659]
Δ(LGCF(-4))	**-1.428285** **[-3.97132]**	-7.469034 [-1.89640]	-6.834793 [-3.55707]	-0.273984 [-0.86057]
Δ(LGCF(-5))	0.666872 [1.42922]	8.076079 [1.58053]	1.180313 [0.47348]	0.283410 [0.68614]
Δ(LGCF(-6))	0.684904 [1.61118]	-11.66317 [-2.50539]	6.215404 [2.73671]	0.304786 [0.80993]
Δ(LGCF(-7))	0.091641 [0.19602]	-6.427073 [-1.25537]	0.505685 [0.20246]	0.446409 [1.07867]
Δ(LGCF(-8))	-0.260550 [-0.62104]	-12.62774 [-2.74852]	-6.681970 [-2.98111]	-0.013309 [-0.03584]
Δ(LGCF(-9))	0.550783 [1.29242]	-4.624119 [-0.99082]	1.440809 [0.63281]	-0.118806 [-0.31492]
Δ(LGCF(-10))	0.084382 [0.26124]	-10.95133 [-3.09602]	1.077770 [0.62454]	0.187810 [0.65683]
Δ(LENDING_RATE(-1))	0.001698 [0.13939]	0.209618 [1.57142]	0.008024 [0.12330]	0.009079 [0.84195]
Δ(LENDING_RATE(-2))	**0.025704** **[2.04521]**	0.241655 [1.75578]	0.057348 [0.85407]	-0.013397 [-1.20413]
Δ(LENDING_RATE(-3))	-0.024605 [-1.61787]	-0.044616 [-0.26789]	-0.041148 [-0.50642]	-0.029493 [-2.19064]
Δ(LENDING_RATE(-4))	-0.030082 [-1.67760]	0.724164 [3.68779]	-0.102675 [-1.07175]	-0.018602 [-1.17188]
Δ(LENDING_RATE(-5))	-0.012022 [-0.55463]	0.767686 [3.23412]	0.019231 [0.16606]	-0.031534 [-1.64339]
Δ(LENDING_RATE(-6))	-0.038491 [-1.71175]	1.114808 [4.52717]	0.090909 [0.75672]	-0.034190 [-1.71762]
Δ(LENDING_RATE(-7))	-0.030941 [-1.36453]	1.219851 [4.91253]	-0.022137 [-0.18273]	-0.013472 [-0.67117]
Δ(LENDING_RATE(-8))	-0.026824 [-1.43033]	0.584343 [2.84528]	0.022845 [0.22801]	-0.014597 [-0.87925]
Δ(LENDING_RATE(-9))	-0.022895 [-1.38532]	0.600691 [3.31903]	0.022979 [0.26025]	0.012762 [0.87234]
Δ(LENDING_RATE(-10))	-0.004850 [-0.35733]	0.389079 [2.61750]	-0.001769 [-0.02439]	0.001009 [0.08394]
Δ(LGDEF(-1))	-0.063391 [-0.63828]	5.671625 [5.21476]	0.632246 [1.19155]	-0.226095 [-2.57165]

Δ(LGDEF(-2))	-0.204717 [-1.79886]	4.544506 [3.64650]	-0.427160 [-0.70255]	-0.069848 [-0.69333]
Δ(LGDEF(-3))	-0.141608 [-1.79190]	3.523769 [4.07175]	-0.040739 [-0.09649]	-0.139799 [-1.99835]
Δ(LGDEF(-4))	-0.102719 [-1.42229]	4.424944 [5.59490]	-0.320706 [-0.83117]	0.006849 [0.10713]
Δ(LGDEF(-5))	0.017176 [0.28047]	2.153284 [3.21088]	0.638304 [1.95097]	-0.085421 [-1.57573]
Δ(LGDEF(-6))	-0.050476 [-0.67319]	3.496717 [4.25853]	-0.073625 [-0.18379]	0.042282 [0.63701]
Δ(LGDEF(-7))	-0.086072 [-1.81943]	1.093412 [2.11059]	0.000934 [0.00369]	-0.078141 [-1.86593]
Δ(LGDEF(-8))	-0.048531 [-0.99973]	2.054181 [3.86410]	-0.306492 [-1.18176]	0.001350 [0.03142]
Δ(LGDEF(-9))	0.016837 [0.35836]	0.756462 [1.47028]	0.293419 [1.16897]	-0.044275 [-1.06456]
Δ(LGDEF(-10))	-0.057129 [-1.09775]	2.403816 [4.21790]	0.133641 [0.48066]	0.013509 [0.29324]
Δ(LGDP(-1))	0.900893 [1.38288]	-42.64970 [-5.97822]	-3.302739 [-0.94892]	-0.041562 [-0.07207]
Δ(LGDP(-2))	0.588743 [1.09100]	-25.40882 [-4.29959]	-2.353667 [-0.81637]	-0.415726 [-0.87025]
Δ(LGDP(-3))	**0.767558** **[2.23325]**	-18.24414 [-4.84725]	-3.052201 [-1.66221]	-0.626804 [-2.06015]
Δ(LGDP(-4))	0.143220 [0.27308]	-8.011945 [-1.39500]	-6.752204 [-2.40981]	-1.045787 [-2.25255]
Δ(LGDP(-5))	-0.030427 [-0.05039]	16.08724 [2.43270]	-4.994031 [-1.54796]	-1.263732 [-2.36405]
Δ(LGDP(-6))	-0.588654 [-0.82788]	6.325027 [0.81230]	-2.131008 [-0.56097]	-1.488264 [-2.36443]
Δ(LGDP(-7))	**-1.268624** **[-2.12592]**	19.09955 [2.92268]	-1.300064 [-0.40778]	-0.502974 [-0.95214]
Δ(LGDP(-8))	-0.572457 [-1.26434]	20.87646 [4.21041]	-0.224877 [-0.09296]	0.387621 [0.96710]
Δ(LGDP(-9))	0.319885 [0.71370]	12.58753 [2.56454]	5.328512 [2.22523]	0.438450 [1.10505]
Δ(LGDP(-10))	0.632974 [1.22011]	21.70217 [3.81998]	4.534987 [1.63619]	0.959632 [2.08957]
ECT	0.153318 [1.69695]	**-5.719753** **[-5.78094]**	-0.013467 [-0.02790]	0.148207 [1.85304]
R-squared	0.948342	0.931610	0.938113	0.868332
Adj. R-squared	0.741710	0.658049	0.690564	0.341659
Sum sq. resids	0.024273	2.910953	0.692841	0.019022
S.E. equation	0.049268	0.539532	0.263219	0.043614
F-statistic	4.589524	3.405491	3.789605	1.648713
Log likelihood	122.7145	0.649437	37.25305	128.9314

Akaike AIC	-3.204491	1.582375	0.146939	-3.448291
Schwarz SC	-1.651454	3.135411	1.699976	-1.895254

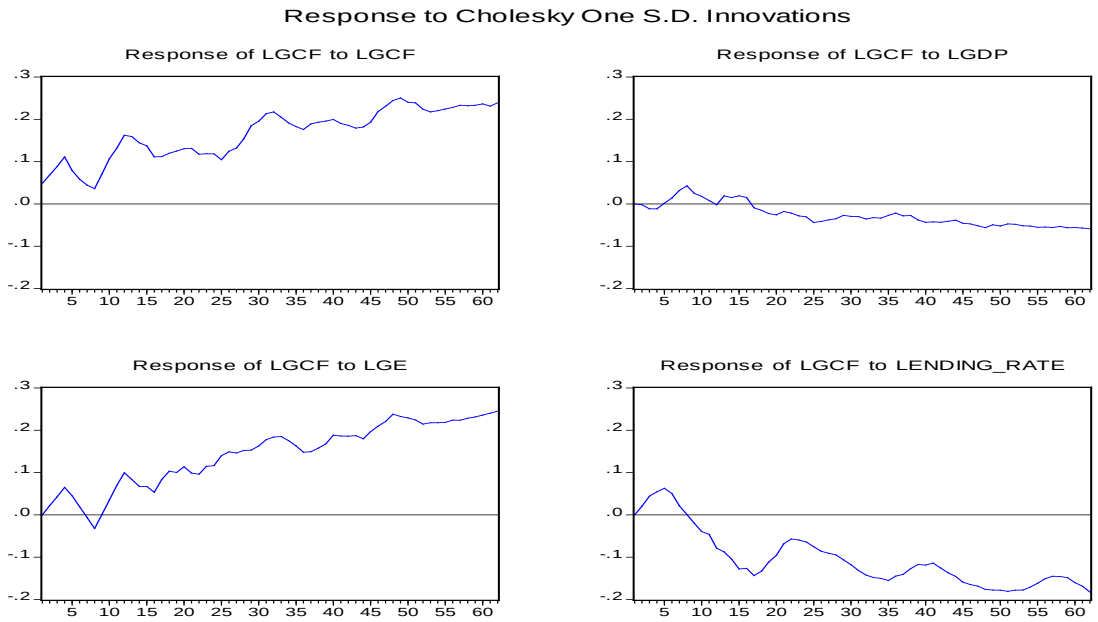
5.5 Impulse Response Analysis

According to Mitchell (2000), impulse response analysis is used widely in the empirical literature to uncover the dynamic relationship between macroeconomic variables within vector-autoregressive (VAR) models. Impulse responses measure the time profile of the effect of a shock on the expected future values of a variable. It traces the effect of a standard deviation shock to one endogenous variable.

Figure 5.1 presents impulse response functions of Namibia's gross fixed capital formation to shocks in gross fixed capital formation, gross domestic product, government expenditure and lending interest rate. This impulse response is for the first model of private investment with government expenditure.

Figure 5.1 shows that the effect of a one standard deviation impulse response to Namibia's gross fixed capital formation on itself, results is positive from the first quarter and lasting for the entire period. A shock to gross domestic product tends to have no effect on first quarter but between second quarter of the first year and last quarter of fourth year has a mixed (negative and positive) effects and starting from the first quarter of the fifth year has negative effect on gross fixed capital formation lasting for the entire period. A shock to government expenditure has a mixed (positive and negative) effect on the gross fixed capital formation in the first two years but it has positive effect from the first quarter of the third year lasting for the entire period. Lastly, a shock to the lending interest rate has a positive effect on gross fixed capital formation in the first two year but negative effect from the first quarter of third year lasting for the whole period.

Figure 5.1 Impulse Responses to Gross Fixed Capital Formation for the First Model



5.6 Variance Decomposition

Forecast error variance decomposition is conducted to assess the extent to which the macroeconomic variables (gross domestic product, government expenditure and lending interest rate) used in the VECM, affect gross fixed capital formation (private investment) over time. For space consideration, the table for variance decomposition is presented in 5 quarter period intervals for the whole period of 62 quarters.

Table 5.8 Variance Decomposition of Gross Fixed Capital Formation (private investment) For the First Model

Period	S.E.	LGCF	LGDP	LGE	LENDING_RATE
1	0.048699	100.0000	0.000000	0.000000	0.000000
5	0.227313	64.84093	0.531280	16.64003	17.98776
10	0.294081	65.51806	4.958778	13.05382	16.46934
15	0.519936	61.24416	1.970906	15.57478	21.21016
20	0.680435	51.27637	1.523821	18.48965	28.71015
25	0.789939	49.27256	1.841198	24.18648	24.69976
30	0.961898	47.17204	1.879742	28.91994	22.02828
35	1.182204	45.87257	1.605580	30.37124	22.15061
40	1.342530	45.67120	1.540746	30.92321	21.86484
45	1.501053	44.21285	1.628600	32.50725	21.65130
50	1.718275	43.25617	1.689460	33.46624	21.58813
55	1.899598	42.40780	1.740973	34.00050	21.85073
60	2.065982	42.19061	1.827559	34.86883	21.11300
62	2.136577	41.87042	1.855265	35.18210	21.09221

Table 5.8 presents results of variance decomposition of Namibia's private investment first model. The results indicate that the variables in the first model explain 58% of the variance in gross fixed capital formation (private investment). Government expenditure accounts for more than 35% of the variance in gross fixed capital formation over the whole period. Lending interest rate explain more than 21% whilst gross domestic product only accounts for about 2%.

5.7 The Effectiveness of Fiscal Spending in Namibia

The effectiveness of fiscal spending in Namibia is determined by looking at the coefficients of government expenditures and government deficit. From the long-run relationship equation (5.1) the coefficient of government expenditures (1.002275) is positive and statistically significant and the long run relationship equation (5.5) the coefficient on the government deficit (-0.913569) is negative and statistically significant. According to the long run relationship equation (5.1), in the long-run government expenditure has a positive impact on private investment. According to the long run relationship equation (5.5), the government deficit has a negative impact on private investment in Namibia.

The positive sign on the coefficient of government expenditure seems to suggest that government expenditures crowds in private investment in Namibia. The negative sign on the coefficient of government deficit seems to suggest that government deficit crowds out private investment in Namibia. The magnitude of the coefficients help us to determine if the fiscal spending has been effective or not in Namibia.

If the long run coefficient of government expenditure is large compare to the long run coefficient of government budget deficit then we can conclude that in the long run fiscal spending has been effective in Namibia. If the long run coefficient of government expenditure is smaller compared to the long run coefficients of the government budget deficit then we can

conclude that in the long run fiscal spending has not been effective in Namibia. In the long-run private investment in Namibia increases by 1.002% (equation 5.1) as a result of a one percent increase in government expenditures and at the same time private investment decreases by 0.914% (5.5) as a result of a one percent increase in government budget deficit. Therefore, we can conclude that fiscal spending has been relatively effective in Namibia by 0.088 percent.

VI CONCLUSIONS

This paper analyzed the effectiveness of fiscal policy in the context of the crowding out and crowding in hypothesis in Namibia. We carried out analysis using quarterly data on gross domestic product, government expenditure, gross fixed capital formation, the lending interest rate and the government budget deficit from 1990;Q1 to 2005;Q2. Two investment models have been estimated. The first model has gross fixed capital formation, government expenditure, the lending interest rate and gross domestic product variables but exclude the government budget deficits variable. The second model has gross fixed capital formation, government budget deficit, lending interest rate and gross domestic product but excludes government expenditure variable. These long-run relationships have been estimated and analyzed by performing Augmented Dickey Fuller unit root test, Johansen co-integration technique and vector error correction model.

Augmented Dickey Fuller tests show that all these time series are non-stationary in levels and become stationary after the first difference operator i.e., they are integrated of order one I (1). The results show that all the variable have expected signs and are statistical significant. The results also show that there is a long run positive relationship between private investment and gross domestic product. Furthermore, there is a negative relationship between private investment and the lending interest rate. The results from the first error correction model suggest that about 87 percent of the adjustment of Namibia's private investment toward long run equilibrium takes place in the first quarter. The results from the second error correction model do not help us to say something about the speed of adjustment that takes place toward long run equilibrium. As for the crowding out/crowding in debate, our results verify both the Keynesian and neoclassical view for Namibia. While increases in government expenditures are found to crowd in private investment, increases in government deficit crowd out private investment in the long run. Taken together, the crowding in effect outweighs the crowding out effect in Namibia

REFERENCES

Adnan Hussain, Sulaiman D. Mohammad, Kamran Akram and Irfan Lal (2009) **Effectiveness of Government Expendeture Crowding-in or Crowding-out**: Empirical Evidence in Case of Pakistan. European Journal of Economics, Finance and Administrative Sciences ISSN 1450-2887 Issue 16 (2009)

AHMED, Habib, and Stephen M. MILLER (2000) **Crowding-Out and Crowding-In Effects of the Components of Government Expenditure**, Contemporary Economic Policy, 18, 124-133.

Akinboade, Oludele Akinloye (2004). **The relationship between budget deficit and interest rates in South Africa**: some econometric results', Development Southern Africa, 21:2, 289— 302

Al. Turki Suliman M. (1995). **On the Construction of Quarterly Time Series Data for the Gulf Cooperation Council Economies**. Journal of King Saudi University, Vol 7, Administration Sciences (2), pp 107-118.

António Afonso and Ricardo M. Sousa (2009), **Macroeconomic Effects of Fiscal Policy,** European Central Bank Working Paper Series No N991

Aschauer, D.A. (1989b), **Does Public Capital Crowd out Private Capital**, Journal of Monetary Economics 24, 171–188.

Ashipala, J. and N. Haimbodi (2003), **The Impact of Public Investment on Economic Growth in Namibia**, NERPU Working Paper no 88.

Atukeren, Erdal (2005). **Economic and Institutional Determinants of the Crowding-in Effects of Public Investments in Developing Countries.** Swiss Institute for Business Cycle Research (KOF/ETH Zurich) WEH - ETH Zentrum, CH-8092 Zurich, Switzerland. (version: 14 October 2005)

Baldacci. E., A.L. Hilman, and N.C. Kojo (2004). **Growth, governance, and fiscal policy transition channels in low-income countries**. European Journal of political Economy, 20, 517-549

Bank of Namibia, (1999), Bank of Namibia, Annual Report

Bank of Namibia, (2002), Bank of Namibia, Annual Report

Bank of Namibia, (2003), Bank of Namibia, Annual Report

Bank of Namibia, (2004), Bank of Namibia, Annual Report

Bank of Namibia, (2005), Bank of Namibia, Annual Report

Bank of Namibia, (2006), Bank of Namibia, Annual Report

Bank of Namibia, (2007), Bank of Namibia, Annual Report

Benethelin Zaaruka, Benjamin Biwa and Paul Kalenga, (2001). **Public Expenditure Management in Namibia Health and Education Sectors**. Bank of Namibia Working Paper **No.1**/02.

Bebi, Hoster 2000. **Sustainability of budget deficits**: A case study of Namibia (1991-1999). NEPRU Working Paper No. 73. Windhoek.

Branson W. H. (1989), **Macroeconomic Theory and Policy.** New York: Harper & Row.

Eduardo Cavallo, and Christian Daude.(2008) **Public investment in developing countries : a blessing or a curse?** Inter-American Development Bank, Working Paper 648

Ganelli, Giovanni (2003). **Useful Government Spending, Direct Crowding-Out and Fiscal Policy Interdependence.** Journal of International Money and Finance, 22, 87-103.

Greene, William H. (1990) **Econometric Analysis**. MacMillan, New York.

Hoster Bebi, (2000). **Sustainability of budget deficits**: A case study of Namibia
(1991-1999), NEPRU Working Paper no 73.

Hyder, K. (2002). **Crowding-out Hypothesis in a Vector Error Correction Framework**: A case study of Pakistan. The Pakistan Development Review 40(4): 633-650

John T. Donnelly (1973). **External Financing and Short term Consequences of External Debt Servicing for Brazilian Economic Development, 1947-1968**. The Journal of Developing Areas, Vol. 7, No. 3 , pp. 411-430

Kenneth N. Kuttner and Adam S. Posen (2002), **Fiscal Policy Effectiveness in Japan,** Journal of the Japanese and International Economies **16**, pp 536–558

Khan, Rana Ejaz Ali and Gill, Abid Rashid (2009). **Crowding Out Effect of Public Borrowing**: A Case Study of Pakistan, The Islamia University of Bahawalpur, Pakistan

Majumder, A. M. (2007). **Does public Borrowing Crowd-Out Private Investment?** The Bangladesh Evidence, Policy Analysis Unit., Working Paper Series: WP 0708

SADC (2008). The Achievement of SADC macroeconomic convergence Targets in Namibia: Performance Review and Assessment of the implementation plan

Sarah Beth (2006), **Do government purchases crowd out investment?** International Review of Economics Volume 53, Number 3, pp 323-333

PriceWaterHouseCoopers (2007), "**Namibia Budget Review 2007/2008**" **What is Fiscal**

Policy? Retrieved 1st November, 2009, from http://www.investopedia.com/articles/04/051904.asp? viewed=1

Yasim Kustepli (2005) **Effectiveness of fiscal spending? Crowding in or crowding out** Yönetim ve Ekonomi 12/1 (2005) 185-192